

this species have been collected in Florida by Dr. Chapman, in Delaware by Mr. Canby, and in eastern North Carolina by the Biltmore Herbarium. All of the material, except possibly that from Delaware, compares favorably with Mr. Kearney's specimens collected in Cocke county, Tennessee, in habit, lobing of the vexillum and peculiarities of loment. In the plants from Delaware the vexillum is not constantly lobed, differing in this respect, indeed, on the same individual.—C. D. BEADLE, *Biltmore Herbarium*.

### THE GUM OF CANNA.

WHEN a freshly cut tuber of Canna is exposed to the air, there may be observed upon the cut surface, after some hours, the formation of small colorless or pale yellow drops, which stiffen rapidly in the air. From these there finally develop spherical masses of no mean size. Their color varies from very pale yellow to brown or bottle-green. If fractured they show a glistening and conchoidal appearance. This substance has the character of a gum. It is insoluble in water, even after long boiling, and it swells up in precisely the same way as do the gums of the cherry and apple.

When heated upon a platinum knife this gum of Canna swells up, chars, and then burns with a smoky flame, leaving considerable very white and light ash. This ash contains calcium carbonate, magnesium, iron, potassium, and phosphoric and hydrochloric acids.

For the study of the method of the formation of this gum, it was found convenient to use rootstocks which had first been macerated in strong alcohol. Sections were examined, either at once upon being made, or after having been subjected to a double stain produced by successive immersions in a hydro-alcoholic solution of red extract of Cassella, and a similar solution of acid green JEEE (Poirrier).<sup>15</sup> The washings were made in water containing alcohol, and the sections mounted in carefully prepared neutral glycerine.

Staining with haematoxylin gave poor results, probably on account of the resistance offered to its diffusion by the insolubility of the gum.

Upon first examination of the preparations one is tempted to assign

<sup>15</sup> I prepared these solutions according to the following formulæ:

Rouge de Cassella	0.25gm	Acid green JEEE (Poirrier)	0.10gm
Alcohol at 90%	20.00gm	Alcohol at 90%	20.00gm
Distilled water	30.00gm	Distilled water	30.00gm

to the gum-bearing tissue of *Canna* a schizogenous origin. It certainly presents an aspect very suggestive of gum secreting cavities.

The fact is, however, that very little of the gum makes its first appearance upon the cell walls. It forms in thick layers in the cell interior, and, gradually condensing, forces the cytoplasm and its contents into the center. Little by little this alteration extends into neighboring cells. The condensation of the protoplasm is constantly increased in the central cells, whose walls seem to thicken as the membrane increases in volume. At a certain point the protoplasm and the thickened membrane surrounding it blend into a mucilaginous mass. This transformation may appear at first either in a single cell, or in a little group of cells always placed near the center of the mass. In no case did I notice any such intercellular space surrounding the secreting cells as occurs in the ordinary method of formation of secreting canals. The gum of *Canna* is formed in a lysigenous way, just as are those of the acacias, of fruit trees, and especially of the aralias. As gelatinization continues the gum-bearing region spreads, and tends to form pockets of varying form and dimension.

Formations of the same kind may occur in the fibrovascular bundles. Gelatinization is produced first in the wood and woody parenchyma. The gum then penetrates into the vessels, probably by osmosis; the walls of the vessels become gelatinized in their turn, and the whole bundle is transformed into a gum bearing cavity.

There should also be noted the extreme diminution of amidon in the neighborhood, which immediately succeeds the mucilaginous modification.

I have studied the same point in a large number of stems of other *Marantaceæ* taken from dried specimens in the Museum d'Histoire Naturelle, and from the Ecole supérieur de Pharmacie de Paris. In none have I found an analogous formation.—M. L. LUTZ, *Paris, France.*